

Applicant : Preston Whitcomb et al.
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Attorney's Docket No.: 05689-016001

Amendments to the Drawings:

The attached replacement sheet of drawings includes changes to FIGS. 5A-5C and replaces the original sheet including FIGS. 5A-5C.

In FIG. 5A, Applicant amends the drawing to slightly lengthen the arrow F representing the lift force on the upper surface of the interleaf 30, to extend directly from the interleaf, consistent with FIG. 5A in the informal drawings filed with the original application on August 22, 2003.

Attachments following last page of this Amendment:

Replacement Sheets (1 page)
Annotated Sheets Showing Change(s) (1 page)

REMARKS

Claims 1-24 were pending, claims 3, 4, and 16 are cancelled, and claims 18-24 are withdrawn. Applicants amend claims 1, 2, and 15, and add new claims 25 to 27. Claim 25 corresponds to originally filed claim 3, claim 26 corresponds to originally filed claim 4, and claim 27 correspond to originally filed claim 16. Accordingly, no new matter has been introduced.

I. Objections to the Drawings

The Examiner objected to the drawings under 37 C.F.R. § 1.83(a), requesting that Applicants depict a chuck assembly in the figures or cancel this feature from the claims.

Applicants amend claims 2 and 15 and respectfully request that the examiner withdraw the objection to the drawings. Applicant amend FIG. 5A to correct a discrepancy between the originally filed informal drawings and the formal drawings filed on January 13, 2004.

II. 35 U.S.C. § 102 Rejections

Claims 1, 12, 13 and 18-20 are rejected under 35 U.S.C. § 102(b) as being anticipated by Japanese Patent No. 11163091 to Ichikawa (Ichikawa). Applicants traverse this rejection and respectfully requests reconsideration of the rejected claims in light of the above amendments and following remarks.

Based on the available English abstract and figures, Ichikawa appears to disclose a system with controls for transferring a wafer between a cassette case and a wafer container and feeding an interlayer sheet between adjacent wafers. Ichikawa fails to disclose or even suggest a substrate processing system including first and second robotic arms including an end effector attached to the second end of the second robotic arm and configured to apply positive pressure to a surface of the interleaf facing the end effector for capture and release thereof as recited in amended claims 1 and 15.

As explained fully in the specification, certain physical characteristics of an interleaf sheets while advantageous for protecting and minimizing contact between adjacent wafers, can make handling and transport of such sheets difficult. Applicants have determined that the application of *positive pressure* from an end effector is more effective than the application of vacuum for handling certain types of interleaf sheets in semiconductor wafer processing operations.

Specifically, the porosity of an interleaf sheet 30 can lessen the effectiveness of end effectors employing a vacuum for interleaf pickup and result in unintentionally capturing more than one interleaf sheet 30 at a time due with the end effector to a vacuum bleeding through the interleaf sheets 30. Retrieving and releasing multiple interleaf sheets between the semiconductor wafers adversely impacts the packing of the wafers into the shipping containers. A wide variation in porosity of the interleaf sheet 30 prevents use of controlled vacuum flow to pick up single interleaf sheets 30 and use of the vacuum sensor to indicate that more than one interleaf sheet 30 has been picked up. As recited in the claims, the positive pressure from the end effector 80 generates a lift force on the top interleaf sheet 30, such that the top interleaf sheet 30 separates from the interleaf stack 30 and rises to engage the diffuser 110 of the end effector 80. The net upward lift force F that develops on the top interleaf sheet 30 in response to a positive pressure applied by the interleaf end effector 80 is described by a Bernoulli equation for fluid flow along a streamline. See Specification at page 8, line 30 to page 9, line 29, for example.

Claims 12 and 13 depend from claim 1 and are allowable with it. Claims 18-20 are withdrawn from consideration.

III. 35 U.S.C. § 103 Rejections

The Examiner rejected claims 2-11 under 35 U.S.C. § 103(a) as being obvious over Ichikawa in view of U.S. Patent No. 5,569,328 to Petvai et al. (Petvai) and further in view of U.S. Patent No. 6,517,130 to Donoso (Donoso). Applicants traverse this rejection and respectfully request reconsideration of the rejected claims in light of the above amendments and following remarks.

Specifically, the Examiner asserts that it would have been obvious, at the time of the invention, to employ the use of a counterweight, as taught by Petvai, in the device of Ichikawa by attaching the counterweight to the first end of the transfer arm for the purpose of balancing the transfer arm. The Examiner also asserts that it would have been obvious, at the time of the invention to attach a chuck assembly to the second end of a transfer arm for the purpose of providing an improved end effector for the capture and release of the wafers.

Counterweights, as disclosed in Petvai and chuck assemblies as disclosed in Donoso, are common in robotics and automation. However, Petvai and Donoso fail to cure the deficiencies of Ichikawa in that neither reference, considered alone or in combination, disclose or even suggest an end effector configured to apply positive pressure to a surface of the interleaf facing the end effector for capture and release thereof as recited in amended claim 1.

The claimed configuration can also include a sensor to detect the material properties of the interleaf, such a sensor can use differential pressure, reflectance, imaging, capacitance or inductance to detect the material properties of the interleaf as recited in claims 7 and 8, which depend from claim 1. None of Ichikawa, Petvai, or Donoso disclose or suggest the system of claim 1 including a sensor for detecting the material properties of the interleaf as claimed.

Claims 2, 5, 6, 9-11, 25, and 26 depend from claim 1 and are allowable with it. Applicants respectfully submit that the 35 U.S.C. § 103(a) rejection of claims 2, 5, 6, 9-11 should be withdrawn and the claims allowed.

The Examiner rejected claims 14-17 under 35 U.S.C. § 103(a) as being obvious over Ichikawa in view of U.S. Patent No. 4,869,489 to Wirz (Wirz). Applicants traverse this rejection and respectfully requests reconsideration of the rejected claims in light of the above amendments and following remarks.

The Examiner states that it would have been obvious, at the time of the invention, to employ the use of a pneumatic separator, as taught by Wirz, in the device of Ichikawa for the purposes of loosening the uppermost sheet in a stack of sheets and thus facilitating the lifting of the sheet by an end-effector.

Wirz discloses air nozzles positioned along the side of and aligned towards a stack of sheets at the height of the suction nozzles on an end effector. The air nozzles blow air between the uppermost sheets of the stack, thereby loosening the uppermost sheets to facilitate lifting of the uppermost sheet by the suction nozzles.

Despite teaching the injection of air between sheets to loosen the sheets on the stack, Wirz only discloses the application of *suction* forces to lift the uppermost sheet. In contrast, and as described above, Applicants claim an end effector configured to apply positive pressure to a surface of the interleaf facing the end effector in amended claims 1 and 15. Applicant submits that Wirz fails to cure the deficiencies of Ichikawa. Neither Ichikawa nor Wirz, each considered alone or together, disclose an end effector configured to apply positive pressure to a surface of the interleaf facing the end effector. Claim 14 depends from claim 1 and is allowable for at least the same reasons. Claim 16-17 depend from claim 15 and are allowable for at least the same reasons. Applicants respectfully submit that the rejection of claims 14-17 should be withdrawn and the claims allowed.

CONCLUSION

It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment. The Examiner is invited to telephone the undersigned, Applicant's attorney of record, to facilitate advancement of this patent application.

Applicant asks that all claims be allowed.

Upon reviewing the file, applicants noted that they have not received an initialed copy of the enclosed PTO Form 1449 with the final action dated September 9, 2005, that accompanied an

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information disclosure statement filed October 22, 2003. Applicants' records show that this information disclosure statement complied with 37 C.F.R. § 1.97. Thus, we respectfully request that the examiner initial and return this form as soon as possible.

Enclosed is a Petition for Extension of Time and the required fee. Please apply any other charges or credits to deposit account 06-1050, referencing the attorney docket 05689-016001.

Respectfully submitted,

Date: 3/9/2006


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